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(54) Title: CONSUMER ELECTRONICS DEVICES WITH ADAPTABLE UPGRADE CAPABILITY			
(57) Abstract			
<p>An upgradable television, in accordance with the present invention, includes a plurality of modules for providing operating functions for the upgradable television, each module capable of identifying itself to a processor. The processor is coupled to each of the modules. The processor is for recognizing changes in the modules in accordance with the identification of the modules. A receiver is operatively connected to the processor for receiving information for upgrading the upgradable television in accordance with new modules introduced into the upgradable television. A method for upgrading is also described.</p>			

Consumer electronics devices with adaptable upgrade capability.

This disclosure relates to electronic devices and more particularly, to electronic devices with the capability to be upgraded automatically by installing new hardware and/or software and remote diagnostic capability.

5 Current computer systems use the notion of plug and play. Plug and play is the ability to plug in a device into a computer and have the computer recognize the device such that the computer can interact with the device. The user theoretically does not have to do anything other than plug in the device. While this is not a new capability, operating systems have traditionally needed to have any variable machine configuration (including the attachment of additional devices) defined to the operating systems by a user.

10 When a user plugs in a new device, the system detects the presence of the new device and typically asks the user to verify some configuration settings (in typical systems, if the driver is preloaded) or asks the user to feed in a floppy disk, compact disk, etc. with driver and application software.

15 Current television systems are self-contained electronic devices and are therefore static. While television systems have a few jacks for interconnecting video, audio, cable, etc., the television systems are not upgradable. This means that to enhance or update the properties or performance of the television system, a user must purchase a better or newer television system.

20 For some television systems, the television interacts with or includes other systems. For example, teletext is available in Europe. Teletext rotates through a "carousel" of text messages that are selected based on the selections made by the user on a remote control device. If the teletext device is thought of as a plurality of pages, page 1 may show a listing of local movies playing and reference a different page number for more details. For example, pages 55 through 65 may describe each movie and where and when it is playing. The pages 25 are displayed on the television screen and in accordance with user selections. Pages are limited in number for the teletext based on available bandwidth transmitted in a Vertical Blanking Interval (VBI), and are in text and elementary graphics. Teletext is not adaptable based on the hardware of the customer and is not used to program any devices.

The remote station preferably includes a transmitter configured for transmitting upgrade information to the receivers of the plurality of upgradable devices. The upgradable devices each may include a transmitter for transmitting error messages and module failures to the remote station. The remote station is preferably responsive to the error messages and 5 module failures such that the error messages and the module failures are managed remotely at the remote station. Each upgradable device preferably includes stored programs including an operating system for controlling the upgradable device. When at least one upgradable device module is manually replaced by a new module, the processor may further include a mechanism for activating the receiver to enter a listen mode to listen for information needed to 10 make the new module operational. The network may include one of a broadcast network, a cable network, a satellite network and a communications network. The modules of the upgradable televisions may include at least one of replaceable software modules and electronically erasable software modules. The modules of the upgradable televisions may include means for identifying individual modules within each upgradable television. At least 15 some of the upgradable televisions may further include a transmitter for requesting upgrade data from the remote station. The upgrade data is preferably delivered to the upgradable televisions pursuant to a request from the transmitter. The upgradable device preferably includes a television.

Also provided is a method for upgrading an upgradable device. The method 20 including the steps of providing an upgradable device having a plurality of modules configured for providing operating functions for the upgradable device. Each module is configured to identify itself to a processor. The processor is coupled to each of the modules, and the processor recognizes changes in the modules in accordance with the identification of the modules. A receiver is operatively connected to the processor and is configured for 25 receiving information for upgrading the upgradable device in accordance with new modules introduced into the upgradable device. The step of replacing at least one module with a new module is included. The steps of identifying the new module and determining if resources are available for proper function of the new module are also included. The step of automatically retrieving resources from a remote source is included for proper function of the new module 30 such that the upgradable device is upgraded.

In other methods, the step of automatically retrieving resources may include the step of listening for resources transmitted from the remote source. The step of automatically retrieving resources may include the step of requesting resources to be transmitted from the remote source. The upgradable device preferably includes a television.

interfaces, memory devices (random access memory or cache), secondary memory devices (tape CD, CD-ROM) , etc.

Modules 16 each include a memory 17 and a communications port 19. In this way, modules 16 may communicate directly to other modules 16 by communication protocols that may not need to go through CPU 12. This may be implemented using a bus arbitrator. Alternately, communication between modules is through CPU 12 having an operating system 20 which is preferably stored in memory 14. Modules 16 may include device drivers and protocols for interfacing with CPU 12 stored in memory 17. Memory 14 includes software modules 18. Software modules 18 may be manually removable from memory 14 or permanently secured and electronically removable. Each module 18 may include specific information about updates and versions of the software included thereon. Memory 14 preferably includes operating system 20 which provides many functions. Operating system 20 includes a registry of hardware and software components therein. At startup or power up, each hardware component (modules 16) and software component (software modules 18) which is connected to CPU 12 identifies itself to operating system 20. Identification may include having a centralized, pre-assigned code for each device, or the identification may include classification by device type (e.g., memory), capabilities (e.g., 2 gigabit hard drive), ranges of possible hardware addresses, interrupts, or any other identification method. Operating system 20 may itself be an upgradable module similar to modules 16. A kernel or a boot up control device 23 may be included such that if operating system 20 is removed to be upgraded. An upgraded operating system may be loaded and started. Control device 23 may be located anywhere on device 10 as long as communications can be established with operating system 20.

By identifying the components, device 10 knows what hardware/software components are currently available through the registry on operating system 20. Operating system 20 further checks the identification information against the registry to determine if changes have been made. Once new modules are identified an automatic upgrade may be provided, if necessary, to device 10. When new modules are identified, device 10 includes a mechanism such as a control signal which enables a listening mode to "listen" for new drivers, application software or other information needed to integrate and upgrade device 10 to take advantage of the new module(s). Listening may be performed using a receiver 22. Advantageously, device 10 may already include a receiver 22 for receiving transmitted signals. In one embodiment, device 10 may further include a transmitter 24 for requesting specific drivers or other information to be retrieved to upgrade device 10.

further include a receiver 106 for receiving and handling transmission requests from devices 10 which need upgrade or new software pursuant to hardware changes as described above.

In one embodiment of system 100, devices 10 perform tests for debugging and checking device 10 components. This feature permits error information or hardware/software difficulties to be transmitted from device 10 to receiver 106. Device 10 may include a product code and user information for identifying a specific device and its location. In this way, 5 debugging or error correction, conflicts etc. may be resolved remotely and transmitted to devices 10 directly. This advantageously excludes users from debugging devices 10.

Referring to Fig. 3, a method for upgrading a modular device in accordance 10 with the present invention is shown. In block 202, an upgradable device is provided having replaceable modules for performing operating functions of the device. In a preferred embodiment, the upgradable device is a television and more preferably a digital television. As described above, the modules are capable of identifying themselves to a CPU or each other and an operating system stored in a memory. The memory further includes a registry of 15 module identification information as well. In block 204, a module or modules are replaced manually in the upgradable device. This is performed generally by opening up the device a removing a module(s) and installing a new module. In block 206, the device is initialized or otherwise initiates an identification sequence. The modules identify themselves to the operating system which checks for changes in the modules. In block 208, if there is a change 20 in the modules, the operating system determines if any software is missing, if errors or bugs exists or if other problems are present. In block 210, if software is needed or problems exist, the operating system signals a receiver to go into listen mode to retrieve the needed software or resources. In one embodiment, the device may include a transmitter which signals a remote station with a request for software or resources or identifies problems the upgradable device is 25 experiencing with the new module(s). In block 212, software is delivered to the upgradable device according to the needs of the device. In this way, an upgrade and debugging of the device is achieved which is virtually transparent to the user.

Having described preferred embodiments for a novel consumer electronic 30 devices with adaptable upgrade capability (which are intended to be illustrative and not limiting), it is noted that modifications and variations can be made by persons skilled in the art in light of the above teachings. It is therefore to be understood that changes may be made in the particular embodiments of the invention disclosed which are within the scope and spirit of the invention as outlined by the appended claims. Having thus described the invention with the

## CLAIMS:

1. An upgradable television comprising:

- a plurality of modules configured for providing operating functions for the upgradable television, each module configured for identifying itself to a processor;
- the processor being coupled to each of the modules, the processor configured for recognizing changes in the modules in accordance with the identification of the modules; and
- a receiver operatively connected to the processor and configured to receive information for upgrading the upgradable television in accordance with new modules introduced into the upgradable television.

2. The television as recited in Claim 1, wherein the processor includes a memory for storing programs including an operating system for controlling the upgradable television.

15 3. The television as recited in Claim 1, wherein the processor further includes means for activating the receiver to enter a listen mode upon introduction of a new module, whereupon the receiver listens for information needed to make the new module operational.

4. The television as recited in Claim 1, wherein the modules include at least one of  
20 replaceable software modules and electronically erasable software modules.

5. The television as recited in Claim 1, further comprises a transmitter for requesting upgrade data from a remote source, the upgrade data to be delivered to the upgradable television pursuant to a request from the transmitter.

25 6. A system for upgrading and debugging upgradable televisions comprising:

- a plurality of upgradable televisions, each upgradable television including:
  - a plurality of modules configured for providing operating functions for the upgradable television, each module configured to identify itself to a processor;

- identifying the new module and determining if resources are available for proper function of the new module; and
- automatically retrieving resources from a remote source for proper function of the new module such that the upgradable television is upgraded.

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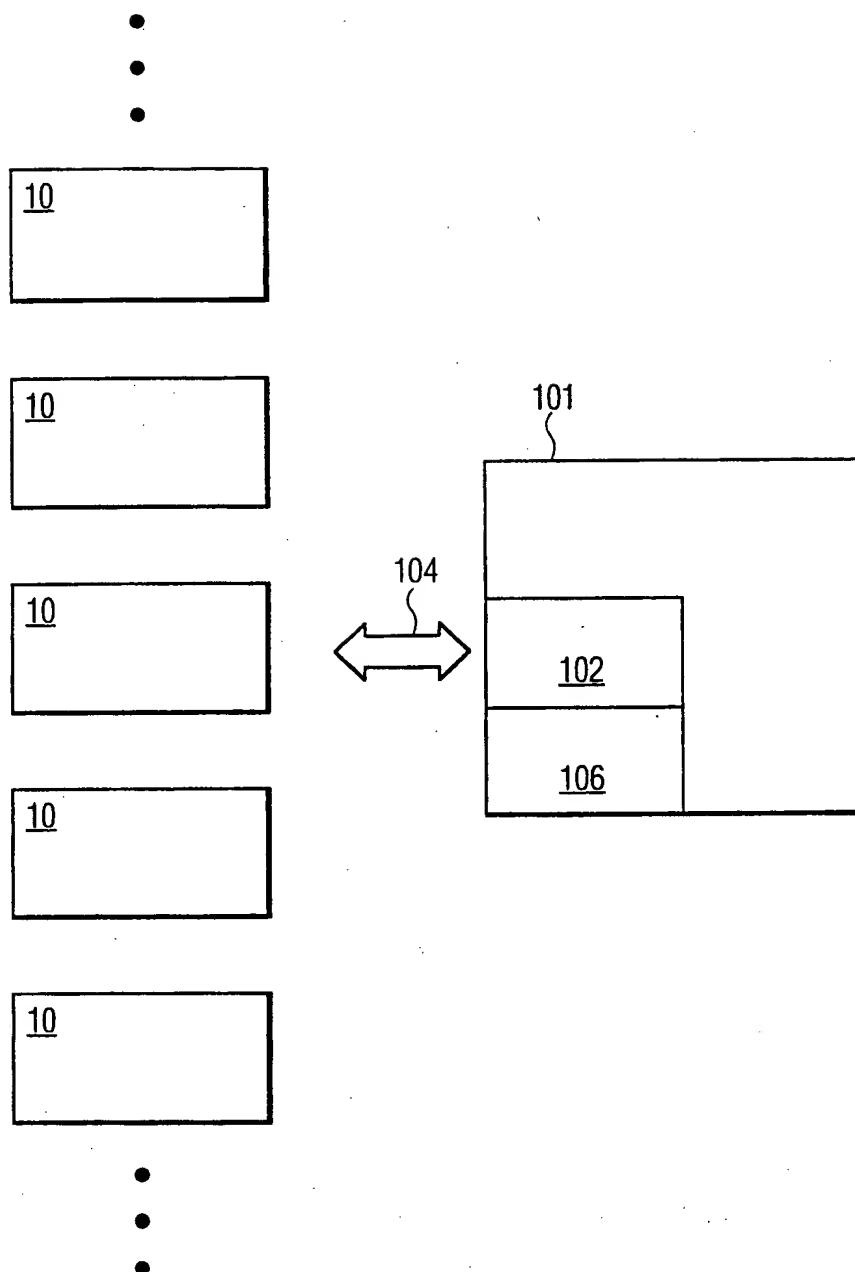


FIG. 2

## INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 G06F9/445 G06F11/22 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 G06F H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC, COMPENDEX

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 809 329 A (ENSTROM MARK R ET AL) 15 September 1998 (1998-09-15) abstract; figure 5 column 3, line 22 -column 6, line 16 column 44, line 22 - line 63	1-7, 9, 10
Y	WO 97 30549 A (POWERTV INC) 21 August 1997 (1997-08-21) abstract; figures 2-4 page 9, line 4 -page 11, line 8 page 15, line 10 -page 16, line 20	1-7, 9, 10

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \* Special categories of cited documents :

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